

## CLAIMS

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1. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer comprising copolymerizing an  $\alpha$ -olefin and an aromatic vinyl compound in the presence of a copolymerization catalyst formed of a transition metal compound component (A) and a co-catalyst component (B) wherein the component (A) employs a transition metal compound having a chemical structure with a metallocene skeleton having two cross-linking groups wherein at least one of the cross-linking groups is a cross-linking group exclusively formed of a carbon-carbon bond cross-linking skeleton.

2. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer comprising copolymerizing an  $\alpha$ -olefin, aromatic vinyl compound, a cyclic olefin, and/or a diene in the presence of a copolymerization catalyst formed of a transition metal compound component (A) and a co-catalyst component (B) wherein the component (A) employs a transition metal compound having a chemical structure with a metallocene skeleton having two cross-linking groups wherein at least one of the cross-linking groups is a cross-linking group exclusively formed of a carbon-carbon bond cross-linking skeleton.

3. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer according to claim 1, wherein the two cross-linking groups of the metallocene skeleton are different from each other.

4. A method for producing an  $\alpha$ -olefin - aromatic vinyl

compound copolymer according to claim 2, wherein the two cross-linking groups of the metallocene skeleton are different from each other.

5. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer according to claim 1, wherein the copolymerization catalyst further containing an alkylating agent (C) is employed as a catalyst component.

6. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer according to claim 2, wherein the copolymerization catalyst further containing an alkylating agent (C) is employed as a catalyst component.

7. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer according to claim 1, wherein copolymerization is performed in the presence of an additional chain-transfer agent.

8. A method for producing an  $\alpha$ -olefin - aromatic vinyl compound copolymer according to claim 2, wherein copolymerization is performed in the presence of an additional chain-transfer agent.

9. A method for producing an  $\alpha$ -olefin - styrene copolymer according to claim 1, wherein the aromatic vinyl compound is styrene.

10. A method for producing an  $\alpha$ -olefin - styrene copolymer according to claim 2, wherein the aromatic vinyl compound is styrene.

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